REMARKS

Reconsideration of this application as amended is respectfully requested. Claims 1, 2, 3, 5, 22 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent number 1,711,653 by Quarles ("Quarles") in view of Federal Telephone and Radio Corporation Reference Data for Radio Engineers (Reference Data for Radio Engineers). Claims 11, 13 through 15 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Drew in view of U.S. Patent number 6,507,606 by Shenoi et al ("Shenoi"). Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Quarles in view of the Reference Data for Radio Engineers and further in view of U.S. Patent number 3,848,098 by Pinel ("Pinel"). Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Quarles in view of Reference Data for Radio Engineers and further in view of Shenoi. Claims 6, 16, and 23 are objected to because of informalities. Claims 6 through 10, 16, 18 through 21, 23 and 25 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claims 6 through 10, 18 through 21, 23 and 25 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. An Advisory Action was mailed on 5-12-04. The Advisory Action did not address the merits of the changes to claims 16-21 and 23 but did provide additional arguments regarding claims 1-5, 11-15, and 22 based upon the arguments submitted in the after final Response submitted by Applicants on 4-20-04.

This amendment addresses both the Advisory Action arguments and the Office Action arguments from 1-20-04. This amendment summarizes the changes to the

patent application from 1-20-04. Claims 11, 16, 18 and 23 have been amended. Claims 6 through 10 and 25 have been canceled without prejudice. New claim 26 has been added. Amendments have been made to comply with requirements of a previous office action and/or to place the rejected claims in a better form for consideration on appeal.

The Advisory Action kindly responded to Applicants' arguments submitted in the response mailed on 4-20-04. The following is a response to the Advisory Action's arguments.

To rebut the Examiner's stated reasons for obviousness, Applicants submit objective evidence of a long felt need for Applicants' invention as defined by the claims, objective evidence raising serious concerns regarding accuracy of the Examiner's assumptions in constructing this calculation, and further arguments that the reasons stated for obviousness of Applicants' claims is the product of inappropriate hindsight. The Examiner stated:

> Quarles therefore teaches a value of the capacitors between .2 and .4 of the capacitance of a loop section. Federal Telephone and Radio Corporation teaches that the capacitance of a mile of 24 AWG telephone transmission line is .075 μF (page 111). A 6,000 foot loop section, therefore, has a capacitance of .075(6000/5280) μF which is equal to .085 μF. Hence, the values Quarles teaches are between .2(85) nF and .4(85) nF, that is, between 17 nF and 34 nF. It would have been obvious to one skilled in the art at the time of the invention to utilize the published values for transmission line capacitance to calculate the capacitances taught by Quarles for the purpose of implementing Quarles's invention. The inter-winding capacitance of a load coil is 1,150 pF (see US Patent 6,546,100 to Drew, column 2, lines 32-33), which equals 1.15 nF. As such, the load coil made obvious by the combination of Quarles and FTRC has capacitance values that are at least 14.8 times the inter-winding capacitance value.

(Office Action dated 1-20-04, pp. 6-7) (emphasis added)

Applicants have argued that although the Examiner's calculation is laudable it is very possibly inaccurate and merely the product of impermissible hindsight. The Examiner has taken values from three different sources to make this calculation and conclusion of obviousness work. A capacitive ratio value from a 1929 load coil designed to eliminate distortion in the voice frequency range, parasitic capacitive values of modern telephone lines based loop length for a reference chart, and an interwinding capacitive value from a modern load coil specifically designed to be compatible with DSL signals. Notably, one of the cited sources, Drew, discusses in the Background section, the problems that modern day high frequency signal encounter with typical load coils installed in modern telephone lines. The 1929 load coil disclosed in Quarles would certainly have been available at the time Drew was filed in 1998. The 1929 load coil disclosed in Quarles could have been installed in the modern telephone line. However, Drew expresses that the structure and electrical characteristics of these older load coils installed in modern telephone lines is not compatible with passing high frequency signals. Drew is not the only reference cited by the Examiner that belies the assumptions that the Examiner has asserted about the working characteristics of the Quarles load coil. In fact, all of the modern DSL compatible load coil reference cited by the Examiner, discuss in the Background section, the same problem that modern day high frequency signals encounter with typical load coils installed in modern telephone lines. U.S. Patent Application Publication number 2002/0113649 A1 entitled "Long subscriber loops using modified load coils" by Tambe et al. ("Tambe") filed in 2001 discloses:

> Moreover, loops longer than (approximately) 18 thousand feet have a lowpass characteristic that even affects the voice band. <u>Such loops are</u>

> specially treated by the addition of load coils and are called "loaded loops". The principle is to splice in series-inductors which have the impact of "boosting" the frequency response at (approximately) 4 kHz with the secondary effect of increasing the attenuation beyond 4 kHz very substantially. In these loaded loops, the spectral region above 10 kHz is unusable for reliable transmission. Consequently, the categorical statement can be made that DSL (including ADSL, "2B+D", and other flavors of DSL) cannot be provided over long loops and definitely cannot be provided over loaded loops.
>
> Heretofore, there has not been a completely satisfactory approach to providing DSL over long loops. Further, there has not been a satisfactory approach to providing DSL over loaded loops. What is needed is a solution that addresses one, or both, of these requirements.

(Tambe Background section, Paragraphs 0013 and 0014) (emphasis added)

Tambe emphasizes that high frequency signals categorically and definitely cannot be provided over loops with the existing load coils installed.

As discussed above, Drew titled "Load coil device" and filed in 1998 discloses:

> Distributed stray capacitance of twisted pair lines causes an insertion loss, or attenuation, that increases with frequency. In long telephone lines, that is, lines longer than 18,000 feet, this insertion loss adversely affects plain old telephone service (POTS), which operates in the voice frequency (VF) band. The VF band is the frequency range from 300 Hz to 4 kHz. Load coils added at regular intervals in a long line compensate the distributed stray capacitance, thereby flattening the frequency response of the line in the VF band. However, these added load coils increase the insertion loss at frequencies above the VF band. This loss is a problem for services such as asynchronous digital subscriber line (ADSL), which operates using high frequency signals, that is, signals in the frequency range of 20 kHz to 1.1 MHz, that range hereinafter will be referred to as the high frequency band.

(Drew Background section, Paragraphs 0013 and 0014) (emphasis added)

Shenoi titled "Asymmetric digital subscriber line methods suitable for long subscriber loops" and filed in 2001 discloses:

> Asymmetric digital subscriber loop (ADSL) was proposed to provide a much higher data rate to the customer in a manner that coexisted with POTS. Recognizing that the spectral occupancy of POTS is limited to low frequencies, the higher frequencies could be used to carry data (the

> so-called Data over Voice approach). Nominally, ADSL proposed that 10 kHz and below would be allocated to POTS and the frequencies above 10 kHz for data. Whereas the nominal ADSL band is above 10 kHz, the latest version of the standard specifies that the "useable" frequency range is above 20 kHz. This wide band between 4 kHz and the low edge of the ADSL band simplifies the design of the filters used to segregate the bands.
>
> . . .
>
> A stumbling block in specifying, or guaranteeing, a definite bit rate to a customer is the nature of the loop plant. . . .
>
> <u>Such loops are specially treated by the addition of load coils and are called "loaded loops". The principle is to splice in series-inductors</u> which have the impact of "boosting" the frequency response at (approximately) 4 kHz with the secondary effect of increasing the attenuation beyond 4 kHz very substantially. In these loaded loops, the spectral region above 10 kHz is unusable for reliable transmission. Consequently, <u>the categorical statement can be made that DSL (including ADSL, "2B+D", and other flavors of DSL) cannot be provided over long loops and definitely cannot be provided over loaded loops.</u>
>
> <u>Heretofore, there has not been a completely satisfactory approach to providing DSL over long loops. Further, there has not been a satisfactory approach to providing DSL over loaded loops.</u> What is needed is a solution that addresses one, or both, of these requirements.

(Shenoi Background section, Col. 2, Lns. 13-60) (emphasis added)

Two references previously submitted by the Applicants discuss the same problem. United States Patent number 6,281,454, entitled "Switchable load coil case" by Charles filed June 21, 1999, and United States Patent number 5,929,402, entitled "Switchable load coil case including multiple circuit rotary switch assembly" by Charles filed November 29, 1996 both disclose:

> Load coil cases are typically used for housing the plurality of load coils associated with each of the 50, 100, 200, 400, 600, 1200 or 1800 wire pairs. After the individual wire pairs are connected to a corresponding load coil, they are typically assembled in a compact configuration in the load coil case and the load coil case is filled with an appropriate encapsulating or potting compound to keep moisture from affecting the load coils, such as by oxidizing the metallic inductor cores, damaging the insulation of the wires in the load coil, or forming conductive paths between wire pairs which would result in degraded compensation and cross linking and cross talk between wire pairs. The load coil may then

> be stored in pedestal cabinets, in underground manholes, and the like. In many applications, however, when the subscriber wants high frequency service, each and every load coil located between the source and subscriber must be "unloaded" or bypassed from the wire pair servicing the particular subscriber. In order to bypass the load coil, each load coil case must first be located in the dirt, water, and other debris typically found in the outside plant telephone environment.

(Charles Background section, Col. 1, Lns 29-50) (emphasis added)

All five of these references teach that use of prior load coils causes problems when a high frequency signal transmitted across the telephone lines encounters a typical load coil installed in the modern telephone lines. All five of these references make strong statements that transmitting high frequency signals across telephone lines with a typical load coil such as Quarles load coil was "categorically" "definitely" not possible. The fact that five patents are directed towards solving the problem of transmitting high frequency signals across load coils proves that a lot of research and development was going into solving this problem. Yet, not one of these five cited references suggests, and all of them would in fact teach away from using the electrical component configuration of an existing load coil. The references provide objective evidence to the contrary that it would **not** be obvious to one skilled in the art to select the electrical component configuration of an existing load coil and then select the appropriate values for those components to solve this modern day problem. Applicants' assert that these five references demonstrate that only through the impressible use of hindsight based upon Applicants' own disclosure would one skilled in the art select the electrical component configuration of an existing load coil, such as in Quarles, and the appropriate capacitive values and relationships stated in Applicants' claim 1, to solve this modern problem that the existing load coils are causing. There it would **not** be

obvious for one skilled in the art to combine the prior art load coil disclosed in Quarles with standard capacitance values the lengths of modern telephone wire and end up with capacitors that have "capacitive elements that have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding." Moreover, it would **not** be obvious for one skilled in the art to combine the prior art load coil disclosed in Quarles with standard capacitance values the lengths of modern telephone wire and use an interwinding capacitance value from a third reference (Drew) that teaches away from using existing load coils to solve this problem and end up with capacitors that have capacitive elements that have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding.

As indicated above, the assumptions the Examiners uses to make this calculation are probably in error due to the undisputable fact that at the time of filing of the above five references and Applicants' patent application, a widespread problem existed that high frequency signals "categorically" "definitely" could not be passed over the existing load coils. 70 years prior to the publication of these five references, the standard lengths and/or capacitance values of associated with those lengths of telephone wire may have been different than the numbers the Examiner bases his calculation on. Also, the loading coil disclosed in Drew electrically and physically differs in structure that the loading coil disclosed in Quarles. The loading coil in Drew is specifically designed to be compatible with the transmission of DSL signals across its load coil. (See Drew Abstract Paragraph) In contrast, Quarles is specifically designed to eliminate distortion in the voice frequency range. (See Quarles Col 1, Lns. 1-26 and

63-69) Therefore, the interwinding capacitance value of the loading coil disclosed in Drew and Quarles may be quite a bit different. Applicants reassert that a large variety of factors can affect the interwinding capacitance value of a load coil. (Applicants will address these factors in response to another Examiner's argument later.) Thus, a comparison of an interwinding capacitance value of the modern load coil disclosed in Drew to the calculated capacitive value from the 1929 load coil in Quarles and a line capacitance value from the Reference Data for Radio Engineers is probably completely inaccurate and does not provide adequate findings of fact factor required by the law. Once again, the interwinding capacitance value of the Quarles loading coil and the Drew loading coil is most likely different because the two coils differ electrically and physically in structure. Further, the above five references in their respective Background sections, strongly indicate that a Quarles load coil with a hypothetical interwinding capacitance value assumed by the Examiner did not exist. Applicants reassert that the actual interwinding capacitance value of the load coil in Quarles is not disclosed. Quarles never mentions the interwinding capacitance value of the load coil. Inserting the interwinding capacitive value from Drew into capacitive ratios from Quarles is most likely an inaccurate assumption.

The Examiner acknowledges, "Quarles discloses capacitance values relative to the length of a local loop segment." (Office Action dated 1-20-04 page 12). As discussed in Tambe, typical load coils are meant to counteract the parasitic capacitance of a loop of telephone wire. That language is exactly what is found in the Quarles reference. (See Quarles Col. 3, Lns. 36-65) Accordingly, Applicants assert that none of the above five references would have discussed the existence high frequency signal

transmission problems with existing load coils if the capacitor in parallel with the interwinding capacitance of the load coil in Quarles already had values to permit the passage of signals in the DSL frequency range. The only sure fact is that in modern times a widespread problem existed that high frequency signals "categorically" "definitely" could not be passed over existing load coils. Using the assumptions the Examiner made to make this calculation, if the 1929 Quarles load was installed in the modern telephone lines, then this widespread problem should have never existed because the hypothetical load coil from the Examiner's calculation, which happens to have capacitive values and relationships that fall within the values stated in Applicants' claim 1, would have passed both high frequency signals and voice signals without significantly attenuating either. Ultimately, the only undisputable fact is that a widespread problem definitely existed that high frequency signals "categorically" "definitely" could not be passed over the existing load coils. Therefore, Applicants reassert that the assumptions for the Examiner's calculation is most likely inaccurate and furthermore the product of inappropriate hindsight gleaned based upon Applicants' own disclosure. Therefore, the load coil recited in claim 1 is not is not rendered obvious by Quarles, Drew, and the Reference Data for Radio Engineers, individually or in combination.

Next, Applicants' invention as claimed provides a solution that solves this long-felt need of a load coil that permits the passage of high frequency signals. This persistent problem has been documented by the above five references. Accordingly, Applicants' invention as claimed provides a solution unique from the above five cited references that solves this long-felt need for a load coil that can pass signals in a

frequency range higher than voice. Therefore, the load coil recited in claim 1 is not is not rendered obvious by Quarles, Drew, and the Reference Data for Radio Engineers, individually or in combination.

Next, in the Advisory action in note 9, the Examiner, states: "The method of selection of the capacitance values is not an element of Claim 1." Applicants reassert that in the Electrical arts three aspects of limitations in claim that must be considered for patentability. One of those aspects is the component values associated with the electronic components to perform a function. Depending on the value chosen for an electronic component and the electronic component's relationship to other electrical components in the same circuit very different results may be produced. Accordingly, Claim 1's functional phrase "wherein the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil" must be considered when the determination of patentability is being made. "A patent applicant is free to recite features of an apparatus either structurally or functionally. In re Schreiber, 439 F.2d 210, 212 169 USPQ 226, 228 (CCPA 1971) and MPEP 2173.05(g). "[T]here is nothing wrong with [defining something by what it does rather than what it is] in drafting patent claims." Greenberg v. Ethicon Endo-Surgery, Inc. 91 F.3d 1580, 39 USPQ2nd 1783 (Fed. Cir. 1996). The relationships and values with the associated electronic components are "functional limitations [that] must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of the pertinent art in the context in which it is used. A functional limitation is often used in association with

an element . . . to define a particular capability that is recited by the particular capability." MPEP 2173.05(g). Applicants assert that in the Electrical arts component values associated with the electronic components to perform a function must be considered when making a determination about patentability of a recited claim.

Also, the federal courts when discussing the doctrine of a novel new use of an apparatus with approximately the same structure follow the rule that "a slight structural change will support a patent when the difference is critical in terms of function." Mehl/Biophile International Corp. v. Milgraum, 8 F. Supp. 2d 434, 446 47 USPQ2d 1248, 1258 (D. N.J. 1998), aff'd 192 F.3d 1362, 52 USPQ2d 1303 (Fed. Cir. 1999). Applicants structure in claim 1 states "wherein the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil." Therefore, Claim 1's functional phrase "wherein the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil" must be considered when the determination of patentability is being made.

Next, in the Advisory Action in note 10, the Examiner, states that the cited materials do not specifically address interwinding capacitance of telephone loading coils. Applicants reassert that capacitance between any two conductive elements will always be determined by the basic formula: the Dielectric Constant times the number of plates of the capacitor times the area of the plates all divided by the distance between

the plates. This formula is always true whether you are discussing interwinding capacitance between windings of a transformer, interwinding capacitance between windings of a telephone load coil, capacitance between terminals of a transistor, or capacitance between human being and a power line. The reference submitted by Applicants expresses this concept in slightly different words. "The basic procedure begins with a calculation of the interface capacitance C1 between one pair of layers see (Fig. 9.8a). This capacitance is a function of the d-c or static, capacitances Co (see Fig. 9.8b) between layers which are treated like plates of a capacitor.

$$Co = \frac{\acute{\varepsilon} \underline{W_L \lambda}}{d_1}$$

Where Co is capacitance, $\acute{\varepsilon}$ is the average relative dielectric constant of the insulation, $\underline{W_L \lambda}$ is the number and area of the windings, and d_1 is the spacing between layers. (Grossner, P225-P226)

Moreover, the Examiner cited to the Applicants a reference titled "Transformer General Parameters for Telecom Magnetic Component" to define the Examiner's understanding of interwinding capacitance. (Office Action dated 1-20-2004, Page 4) The Transformer General Parameters for Telecom Magnetic Component reference expressly states, "The interwinding capacitance is affected by the dielectric material between the windings, the surface area and the distance between windings." (See Transformer General Parameters for Telecom Magnetic Component, Page 1). The other two references submitted by the Applicants demonstrate the principle of adding tape to the windings of a transformer acts as an insulator to decrease both the intrawinding capacitance and interwinding capacitance by effecting the dielectric

constant. Therefore, the Examiner must consider for any two coils the interwinding capacitance between those two coils is affected by the dielectric material between the windings, the surface area of the windings and the distance between windings.

Accordingly, Applicants submit interwinding capacitance between the windings forming a load coil can be affected by many factors such as the proximity of the two windings, the composition of the windings, whether insulation surrounds each winding, etc. Applicants submit although the calculation provided by the Examiner is laudable. The calculation is merely the product of inappropriate hindsight in an attempt to achieve a capacitance ratio stated in claim 1. Once again, the interwinding capacitance value of the Quarles loading coil and the Drew loading coil is most likely different because the two coils differ electrically and physically in structure.

Even so, the resulting calculation from the Examiner merely determines a capacitance value to balance the parallel parasitic capacitance value between two lines forming the loop and is based on the length of the loop. Claim 1 recites language of a capacitance value based on the interwinding capacitance value to pass signals in the DSL frequency range, which may not have any correlation at all to the length of a loop. The interwinding capacitance value may be affected by many factors such as how close the two windings are, whether the windings have insulation or not, what the Dielectric Constant is, the number & area of the coils, etc., yet the length of a telephone loop is not a factor in determining an inter winding capacitance value.

Therefore, for all the reasons stated above, independent claim 1 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Given that claims 2-5 and 24 depend on and include the limitations of claim 1, Applicants respectfully submit the claims 2-5 and 24 are also not obvious in view of Quarles and the Reference Data for Radio Engineers.

Independent Claim 22 recites:

> 22. A system . . . comprising:
> . . .
> a second inductor winding wrapped about the inductor core and coupling the second wire to the fourth wire; and
> capacitive elements configured to pass the DSL signals traversing the first and second local loops, the capacitive elements including
> a first capacitor coupling the first wire to the fourth wire, and a second capacitor coupling the second wire to the third wire, wherein the first capacitor and the second capacitor have capacitance values that are at least four times an inter-winding capacitance value between the first inductor winding and the second inductor winding.

(emphasis added)

Thus, for all the reasons stated above, independent claim 22 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Independent claim 11, as amended, states:

> 11. A system for transmitting DSL and POTS signals over a local loop, the system comprising:
> a first load coil for disposal along the local loop to condition the POTS signals, the first load coil including a coupled inductor and multiple capacitive elements for increasing an effective capacitance of the coupled inductor, wherein the multiple capacitive elements have capacitance values relative to an interwinding capacitance value of the coupled inductor to improve transmission of DSL signals across the first load coil; and
> a first DSL signal repeater for disposal along the local loop in series with the first load coil to amplify the DSL signals, the first DSL signal repeater including a second load coil for conditioning POTS signals passing there through.

(emphasis added)

Thus, for all the reasons stated above, independent claim 11 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Given that claims 12-15 depend on and include the limitations of claim 11, Applicants respectfully submit the claims 12-15 are also not obvious in view of Quarles and the Reference Data for Radio Engineers.

New independent Claim 26 recites:

> 26. A method, comprising:
> passing a first type of signal having a frequency greater than twenty kilohertz of across a coupled load coil that has a first winding, a second winding and a capacitive element disposed in parallel with an inter-winding capacitance between the first winding and the second winding; and
> passing a second type of signal in a voice frequency range across the load coil at the same time as the first type of signal pass through the load coil regardless of whether the second type of signal was transmitted in the same direction in relation to the load coil as the first signal, wherein the <u>capacitive element has a capacitance value that is at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of the first type of signal across the load coil at the same time as the second type of signal</u>.

(emphasis added)

Thus, for all the reasons stated above, independent claim 26 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination. Further, Applicants assert that "passing a first type of signal having a frequency greater than twenty kilohertz of across a coupled load coil" is a functional limitation of this method claim and must be considered by the Examiner when making a determination about patentability.

Regarding the remainder of the Examiner's arguments in the advisory action have been thoroughly discussed in the response submitted on 4-20-04. Applicants thank the Examiner for pointing out the misstatement on page 28 regarding claim 24. Note to the Examiner, the arguments submitted in the non-entered after final amendment on 4-20-04 are resubmitted below without any new arguments. However, the arguments below are accurate and need to be considered.

In general, Applicants submit that DSL signals operate at very high propagation frequencies when compared to the POTS voice frequency range of 0-4 Kilohertz. Applicants submit a reference sheet from Techweb Online[tm] showing transmission rates for various DSL implementation being in the 100 kilohertz range for IDSL to the Megahertz range for VDSL.

The Office Action rejected claims 1, 2, 3, 5, 22, and 24 under 35 U.S.C. §103(a) as being obvious in view of Quarles and the Reference Data for Radio Engineers.

Under 35 U.S.C. § 103, patent law requires both every claim limitation to be disclosed by the combination of references as well as evidence of adequate motivation to combine the references.

> To establish a prima facie case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Manual of Patent Examining Procedure ¶ 2143).

Further, the law also requires:

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the proposed combination of

the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). (Manual of Patent Examining Procedure (MPEP) ¶ 2143.03).

The Examiner states:

> Quarles discloses a load coil comprising a coupled inductor with two windings that inherently have an interwinding capacitance value between them wrapped about an inductor core with capacitors connected diagonally across the windings (i.e., between the input of the first winding and the output of the second winding; and between the input of the second winding and the output of the first winding) (Fig. 1 and page 1, lines 99-102). Claim 1 further claims each have capacitance values at least four times the inter-winding capacitance value. Quarles specifies the value of the capacitors as being half of the value to be used between the middle points of the loading coils (page 4, lines 58-64) which is specified to be between .4 and .8 of the total between the wires of one section of the loop. Quarles therefore teaches a value of the capacitors between .2 and .4 of the capacitance of a loop section. Federal Telephone and Radio Corporation teaches that the capacitance of a mile of 24 AWG telephone transmission line is .075 μF (page 111). A 6,000 foot loop section, therefore, has a capacitance of .075(6000/5280) μF which is equal to .085 μF. Hence, the values Quarles teaches are between .2(85) nF and .4(85) nF, that is, between 17 nF and 34 nF. It would have been obvious to one skilled in the art at the time of the invention to utilize the published values for transmission line capacitance to calculate the capacitances taught by Quarles for the purpose of implementing Quarles's invention. The inter-winding capacitance of a load coil is 1,150 pF (see US Patent 6,546,100 to Drew, column 2, lines 32-33), which equals 1.15 nF. As such, the load coil made obvious by the combination of Quarles and FTRC has capacitance values that are at least 14.8 times the inter-winding capacitance value. Therefore, the combination makes obvious all elements of Claim 1. Claim 1 contains language indicating the inductor is configured to counteract capacitance across the look to improve transmission of POTS-based signals and that the capacitive elements are configured to permit passage of DSL signals. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Because the load coil made obvious by the combination of Quarles and FTRC is structurally identical to the load coil of Claim 1, the recitation related to use carries no weight.

(Office Action dated 1-20-04, pp. 6-7) (emphasis added)

> As examiner has demonstrated in the prior Office action, one skilled in the art seeking to practice the invention of Quarles using available reference materials would arrive at capacitor values that meet the claim. Quarles discloses capacitance values relative to the length of a local loop segment. As demonstrated by examiner in the prior Office action, the industry standard segment length of 6,000 feet (or 1.135 miles as shown in the table on p. 110 in FDRC) results in capacitor values that meet the claim. As such, one skilled in the art seeking to practice the invention of Quarles using the disclosure of Quarles and a reference work in the same field endeavor (i.e., FDRC) would arrive at capacitor values that meet the claim. Applicant alleges that the value of interwinding capacitance in Drew is not acceptable. Examiner disagrees. Drew discloses a typical interwinding capacitance of a prior art load coil. As such, the value is generally applicable to load coils.

(Office Action dated 1-20-04, pp. 12-13) (emphasis added)

However, Applicants respectfully submit that claims 1, 2, 3, 5, 22, and 24 are not obvious under 35 U.S.C. §103(a) in view of Quarles and the Reference Data for Radio Engineers. Claim 1 states:

> 1. A load coil for insertion along a local loop, the load coil comprising:
> a coupled inductor having first and second windings wrapped about an inductor core, each winding having an input and an output, the coupled inductor configured to counteract a parallel capacitance of the local loop to improve transmission of POTS-band signals across the local loop, wherein the first and second windings have an inter-winding capacitance value between them;
> a first capacitive element disposed between the input of the first winding and the input of the second winding; and
> a second capacitive element disposed between the output of the first winding and the output of the second winding, wherein the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil.

(emphasis added)

Quarles explicitly discloses and teaches that the value of the capacitor is significant to Quarles invention, because the value of the capacitor contributes to the

variable effective inductance of the loading unit 5. (See Quarles, page 2, lines 36-58, 85-102, and Equation 1). Equation 1 discloses that the value of the capacitor 8 is used in determining the <u>effective inductance of a network equivalent</u> (FIG. 3) of the <u>loading unit 5</u> in that $L_e = L/(1 + 1/(2p^2LC))$, where <u>C is a capacitance of the condenser 8</u>, L is an inductance of the inductance coil 7, and p is the angular velocity. (Quarles, page 2, lines 36-58) emphasis added) The purpose of Quarles' invention is designed to use the variable effective inductance of the loading unit 5 to correct for transient distortion of POTS signals over each section of line 6, which depends upon the length of each section of line 6. Quarles discloses, "The present invention proposes to overcome this difficulty [of transient distortion of frequencies in the voice range] by using instead of the inductance coils of the Pupin-Campbell system, an improved loading unit, the effective inductance of which is a variable quantity depending upon the frequency of the transmitted waves. (page 1, lines 63-69). Therefore, Quarles clearly discloses and teaches selecting capacitors having a capacitive value based upon the total capacitance measured between the wires comprising each section of line 6. Quarles discloses and teaches selecting capacitors having a particular capacitive value to compensate for transient distortion in voice signals. The Examiner also acknowledges that Quarles discloses and teaches selecting the capacitance value <u>relative to the capacitance value between the two lines</u> making up a twisted pair. (See quoted Office Action page 12 above).

Since Quarles system teaches and is designed to use the variable effective inductance of the loading unit 5 to correct for transient distortions of signals in the POTS frequency range over each section of line 6, which depends upon the lengths of each

section of line 6, it is not surprising that Quarles chooses capacitive values for the condensers 8 (i.e. capacitors) based upon the total capacitance measured between the wires making up a section of line 6. Thus, the selection of the range of the capacitive values for the capacitors in Quarles, referred to as condensers, <u>depends upon a length</u> of each section of line 6.

Quarles does not disclose or suggest that the capacitive values of condensers 8 are selected based upon any capacitance associated with the inductance coils 7. Therefore, nowhere in Quarles does the reference disclose or suggest the structural limitation of "the first capacitive element and the second capacitive element each have <u>capacitance values that are at least four times the inter-winding capacitance value</u> between the first winding and the second winding," as recited in claim 1.

The Reference Data for Radio Engineers merely discloses a capacitance associated with the telephone transmission line. The Reference Data for Radio Engineers discloses the parasitic capacitance between the wires forming the telephone transmission line. The Reference Data for Radio Engineers does not disclose or suggest a capacitance value associated with the inter-winding capacitance between the windings of a load coil. The Reference Data for Radio Engineers does not disclose or suggest a capacitive element having a capacitance value relative to the capacitance value associated with the windings.

Neither reference discloses or suggests the limitation of "the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding," as recited in claim 1.

The Examiner provides a calculation to show a value of a capacitor in an attempt to achieve a stated structural limitation of claim 1. The structural limitation of claim 1 being that the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil. However, the resultant computed capacitance values of the capacitor by the Examiner, if even correct, <u>are based upon the length of the wire forming that segment of the loop</u>. The capacitance value of the capacitors in Quarles are not chosen based upon an inter-winding capacitance value of the load coil. Furthermore, the value of the capacitors in the 1929 Quarles reference are certainly not chosen based upon permitting passage of signals in the DSL frequency range. Some DSL frequencies being, for example, 1000 times greater than those in the POTS frequency range.

Even if adequate motivation existed to combine Quarles and the Reference Data for Radio Engineers, the selection of the range of the capacitive values for the capacitors as taught by Quarles would <u>depend upon a length</u> of each section of line <u>to compensate frequencies in the POTS voice range</u> (0-4 kilohertz) for transient distortion.

The combination of Quarles and the Reference Data for Radio Engineers could at best suggest a capacitive value for a capacitor based upon <u>the length</u> of each section of line in order <u>to compensate frequencies in the voice range</u> for transient distortion. Therefore, claim 1 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Further, claim 1 is not rendered obvious by the combination of Quarles and the Reference Data for Radio Engineers with an inter winding capacitance value from Drew.

The Examiner asserts that one skilled in the art, could looking at the 1929 Quarles, the data chart of the Reference Data for Radio Engineers, a load coil from a third reference Drew, performed the above mentioned calculation and arrive at claim 1's structural limitation without the aid of improper hindsight.

Applicants submit three transformer references with this amendment. Accordingly, Applicants submit interwinding capacitance between the windings forming a load coil can be affected by many factors such as the proximity of the two windings, the composition of the windings, whether insulation surrounds each winding, etc. The basic formula for determining a capacitance value between any two conductive surfaces such as the two winding coils is the Dielectric Constant times the number of plates of the capacitor times the area of the plates all divided by the distance between the plates. Applicants submit although the calculation provided by the Examiner is laudable. The calculation is merely the product of inappropriate hindsight in an attempt to achieve a capacitance ratio stated in claimed 1. However, the resulting calculation from the Examiner merely determines a capacitance value to balance the parallel parasitic capacitance value between two lines forming the loop and is based on the length of the loop. Claim 1 recites language of a capacitance value based on the interwinding capacitance value to pass signals in the DSL frequency range, which may not have any correlation at all to the length of a loop. The interwinding capacitance value may be effected by many factors such as how close the two windings are, whether the windings have insulation or not, what the Dielectric Constant is, the number & area of the coils,

etc., yet the length of a telephone loop is not a factor in determining an inter winding capacitance value.

Also, Drew teaches away from claim 1 limitations. Drew discloses a capacitor connected in parallel to a winding. Drew discloses:

> The device further has a capacitor connected in parallel across each winding. The values of the capacitors are chosen to provide a low impedance path that bypasses the windings for frequencies in the range of 20 kHz to 1.1 MHz

(Drew, Abstract, emphasis added).

> A capacitor 46 having a capacitance of C_{tc} is connected in parallel across the first winding 42, and another capacitor 48 also having a capacitance of C_{tc} is connected in parallel across the second winding 44.

(Drew Col. 3, Lns. 12-15)

Drew discusses and illustrates the interwinding capacitance of the windings. (Drew, Figures 2, 4, and 5 labeled C_{ic}, Col. 2, Ln. 24 - Col. 3 Ln. 20.) However, Drew discloses and teaches to place a capacitor (C_{tc}) in parallel to the winding (L_{choke}) and to choose the value of the capacitor relative to the inductance value of the winding that the capacitor shares a parallel relationship with. Drew discloses:

> The values of the inductance L'_{choke} and capacitance C'_{tc} are 7.5 mH and 100 nF, but they could be in the ranges of 2.5 mH to 10 mH and 50 nF to 200 nF, respectively.

(Drew Col. 3, Lns. 12-15)

Thus, Drew does not teach selecting a capacitance value for a capacitor relative to the inter winding capacitance value between the windings.

As discussed above, Quarles also teaches away from such a limitation. Quarles discloses and teaches selecting capacitors having a capacitive value based upon the total capacitance measured between the transmission wires to compensate for transient distortion in frequencies in the voice range. Therefore, no reference cited by the

Examiner contains adequate motivation to combine to create the structural limitation of "a second capacitive element disposed between the output of the first winding and the output of the second winding, wherein the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil." Further, the combination all three references would still not disclose all of the limitations stated in claim 1.

Federal circuit case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references." In re Lee, 277 F.3d 1338, 1344 (Fed. Cir. 2002). The PTO bears the burden of proving an obviousness type rejection based on findings of fact and not based on conclusive statements. In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999). Adequate findings of fact can come from several sources. Id. The motivation to combine reference must be found in the cited references themselves. Id. Alternatively, the PTO may establish that one of ordinary skill in the art would have been motivated to combine the references with articulated findings of fact regarding: 1) the level of skill in the art; 2) the relationship between the fields of the cited art; and 3) the particular features of the prior art references that would motivate one of ordinary skill in Applicants' particular art to select elements disclosed in references from a wholly different field. Id.

As discussed above, neither Quarles, the Reference Data for Radio Engineers or Drew, teaches or suggests the limitation of "a second capacitive element disposed between the output of the first winding and the output of the second winding, wherein

the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil."

In addition, the articulated findings of fact do not provide adequate motivation to suggest the limitations in claim 1. The loading coil disclosed in Drew electrically and physically differs in structure that the loading coil disclosed in Quarles. Therefore, the inter winding capacitance value of the loading coil disclosed in Drew and Quarles may be quite a bit different. Thus, a comparison of an interwinding capacitance value of the loading coil disclosed in Drew to the calculated capacitive value from Quarles and a line capacitance value from the Reference Data for Radio Engineers may be completely inaccurate and does not provide adequate findings of fact factor required by the law. Once again the interwinding capacitance value of the Quarles loading coil and the Drew loading coil is most likely different because the two coils differ electrically and physically in structure.

As a side note, it seems like the Examiner picked a random length of a loop section to make this calculation work. The Applicants' patent application supplies example loop lengths between 2250 feet and 4500 feet for 24 AWG wire. The Examiner chose to use the capacitance value for a 6000 foot length of 24 AWG in this calculation. Irregardless, any correlation of the values of the capacitors in Quarles to the inter winding capacitance values stated in Drew is mere conjecture and not evidence.

Also, motivation of one of ordinary skill in the DSL art is lacking to select elements disclosed in references. The motivation is lacking in that Quarles teaches

selecting capacitors having a capacitive value based upon the total parasitic capacitance measured between the wires comprising each section of line 6 to compensate for transient distortion in frequencies in the voice range. The 1929 Quarles reference does not disclose or suggest that frequencies in the DSL ranges will travel across plain old telephone lines and Drew teaches away from selecting capacitors having a capacitive value based a capacitance value associated with interwinding capacitance value between inductors. Further, the examiner did not articulate 1) the level of skill in the art; and 2) the particular features of the prior art references that would motivate one of ordinary skill in Applicants' particular art to select elements disclosed in those references to construct the limitations in claim 1.

Therefore, claim 1 is not rendered obvious by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Applicants respectfully believe the Examiner's reliance on Ex Parte Masham is also misguided. In the Electronic/electrical arts, virtually every possible structural configuration of capacitors relating to inductors has been in existence even prior to the 1929 Quarles reference cited by the Examiner. However, whoever invents any new and useful improvement on any <u>process</u>, machine, <u>manufacture</u> or composition of matter <u>may obtain a patent</u>. (See 35 U.S.C. 101). Applicants respectfully submit that at least three factors affect the novelty of invention in the Electrical/electronic Arts. These three factors are 1) the structural relationship of electronic components relative to the other electronic components, 2) the component values associated with each of these electronic components, and 3) the technical application in which the electronic circuit is being employed. The Examiner wishes to discount two of these factors. Depending on

the electronic components chosen, the circuit configuration of those components, and the values chosen for the recited electronic component limitations, the overall claimed electronic circuit can produce very different results.

Applicants respectfully submit that the limitation of "the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil" recited in claim 1, is a structural limitation. All capacitors and inductors have values that affect the reactive impedance presented to signals passing through those reactive components. The reactive impedance of a capacitor is $Xc = 1/2\pi fc$. C is the capacitance value of a electronic component. f is the frequency of a signal propagating through that component. Depending on the value selected for those reactive components, the signals propagating at an associated frequency and passing through those reactive components may be blocked entirely or pass with little attenuation. As such, all of the wording in this limitation must be considered for patentability. The value of the capacitive elements cooperating with the windings of the load coil is chosen to pass signals in the DSL frequency range across the load coil.

The Examiner stated that "a claim containing a 'recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus' if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham,* 2 *USPQ2d* 1647 (Bd. Pat. App. & Inter. 1987). Because the load coil disclosed by Quarles is structurally identical to the load coil of Claim 1, the recitation related to use carries no weight." (Office Action of

1/27/2003, p. 2-3). Applicants respectfully submit that *Ex parte Masham* states that "a recitation with respect to the material intended to be worked upon by a claimed apparatus does not impose any structural limitations upon the claimed apparatus which differentiates it from a prior art apparatus satisfying the structural limitations of that claimed." Applicants respectfully submit that the limitation of "the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil" recited in claim 1, is not a "recitation with respect to the material intended to be worked upon. Further, the limitation is not a recitation of an intended use absent of structural limitations to support that use." Rather, the limitation of "the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value between the first winding and the second winding to permit passage of DSL signals across the load coil" recited in claim 1, is a structural limitation, which differentiates this claim over Quarles and any reliance on *Ex parte Masham*. Based on the capacitance value chosen, signals propagating at a particular frequency, such as at DSL frequencies, across the load coil will pass freely or be attenuated. In the Electronic arts that language is a structural relationship because reactive impedance presented to a signal always is directly proportional to the frequency at which the signal is propagating at. ($X_c = 1/2\pi f c$) Further, as a structural limitation, each and every limitation must be considered and given weight to the patentability of this claim.

Furthermore, MPEP 2131.03 states that "prior art which teaches a range within, overlapping, or touching the claimed range anticipates if the prior art range discloses

the claimed range with "sufficient specificity." Claim 1 recites that "the first capacitive element and the second capacitive element each have capacitance values that are at least four times the inter-winding capacitance value." Applicants respectfully submit that Quarles is silent as to whether any relationship exists between the capacitance values and an inter-winding capacitance value. Accordingly, Quarles can not disclosed a range with sufficient specificity if it does not even discuss that relationship. Therefore, Quarles does not even disclose the structural limitation of "capacitance values that are at least four times the inter-winding capacitance value" with sufficient specificity.

Lastly, if the Examiner still believes that the above limitation is a product by process limitation without explicit structure, then Applicants assert MPEP 2113 and *In re Garnero* control the patentability of the claims in this application. "The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially . . where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product." See, MPEP 2113 and *In re Garnero* ,412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979).

As such, for all the reasons stated above claim 1 is not rendered obvious by Quarles and the Reference Data for Radio Engineers under 35 USC 103(a).

Given that claims 2, 3, 5, and 24 depend on and include the limitations of claim 1, Applicants respectfully submit the claims 2, 3, 5, and 24 are also not obvious in view of Quarles and the Reference Data for Radio Engineers.

The Office Action rejected claim 22 under 35 U.S.C. §103(a) as being obvious in view of Quarles and the Reference Data for Radio Engineers. However, Applicants

respectfully submit that claim 22 is not obvious in view of Quarles and the Reference Data for Radio Engineers. Claim 22 recites:

> 22. A system . . . comprising:
> . . .
> a second inductor winding wrapped about the inductor core and coupling the second wire to the fourth wire; and
> <u>capacitive elements configured to pass the DSL signals traversing the first and second local loops</u>, the capacitive elements including
> a first capacitor coupling the first wire to the fourth wire, and
> <u>a second capacitor coupling the second wire to the third wire</u>, wherein the first capacitor and <u>the second capacitor have capacitance values that are at least four times an inter-winding capacitance value between the first inductor winding and the second inductor winding</u>.

(emphasis added)

As discussed above, Drew does not teach or suggest a second inductor winding coupling the second wire to the fourth wire and a second capacitor coupling the second wire to the third wire. Drew does not teach or disclose creating a L-C bridge network between the input and output windings of the load coil. In contrast, Drew discloses and teaches the configuration of placing a capacitor (C_{tc}) in parallel to the winding (L_{choke}). (Drew, Col. 3 Lns 2-25 and figures 2, 4, and 5) As discussed, Drew also teaches to choose the value of the capacitor relative to the inductance value of the winding that the capacitor shares a parallel relationship with. (Drew, Col. 3 Lns 2-25 and figures 2, 4, and 5) Drew does not teach or disclose capacitors having capacitance values that are at least four times an inter-winding capacitance value between the first inductor winding and the second inductor winding. As discussed, Quarles teaches away from such a limitation. Quarles does not teach or suggest a second capacitor have capacitance values that are at least four times an inter-winding capacitance value between the first inductor winding and the second inductor winding. Quarles discloses and teaches

selecting capacitors having a capacitive value based upon the total parasitic capacitance measured between the wires comprising each section of line 6 to compensate for transient distortion in frequencies in the voice range.

The Reference Data for Radio Engineers is a chart that merely provides parasitic capacitance values based upon a length of a telephone loop wires. The Reference Data for Radio Engineers does not teach or suggest a second capacitor have capacitance values that are at least four times an inter-winding capacitance value between the first inductor winding and the second inductor winding.

Further, neither Quarles nor the Reference Data for Radio Engineers teach or suggest the limitation of "capacitive elements configured to pass the DSL signals traversing the first and second local loops."

As discussed, inadequate motivation exists to combine Quarles and the Reference Data for Radio Engineers. Furthermore, even if Quarles and the Reference Data for Radio Engineers were combined, that combination would not teach the structural limitation of <u>a second capacitor having capacitance values</u> <u>that are</u> at least four <u>times</u> <u>an inter-winding capacitance value</u> between the first inductor winding and the second inductor winding. Further, combination would not teach the structural limitation of "capacitive elements configured to pass the DSL signals traversing the first and second local loops." Therefore, claim 22 is not rendered obvious under 35 USC 103(a) by Quarles and the Reference Data for Radio Engineers, individually or in combination.

Applicants respectfully submit that independent claim 23, as amended, is not obvious in view of Quarles and the Reference Data for Radio Engineers. Claim 23, as amended, recites:

23. A system to improve simultaneous transmission of POTS-band signals and DSL signals across a local loop, the system comprising:
a first local loop, the first local loop including
a first wire, and
a second wire;
a second local loop, the second local loop including
a third wire, and
a fourth wire;
a coupled inductor configured to condition the POTS-band signals traversing the first and second local loops, the coupled inductor including
an inductor core,
a first inductor winding wrapped about the inductor core and coupling the first wire to the third wire, and
a second inductor winding wrapped about the inductor core and coupling the second wire to the fourth wire; and
capacitive elements configured to pass the DSL signals traversing the first and second local loops, the capacitive elements including
a first capacitor coupling the first wire to the fourth wire, and
a second capacitor coupling the second wire to the third wire, wherein the <u>first capacitive element electrically connects in parallel with the inter-winding capacitance between the first inductor winding and the second inductor winding</u>.

(emphasis added)

As discussed above, Drew does not teach or suggest a capacitor to electrically connect in parallel with the inter-winding capacitance between the first inductor winding and the second inductor winding. Drew teaches schematically illustrates the inter-winding capacitance between the inductor windings but teaches away from such a limitation. In contrast, Drew discloses and teaches to place a capacitor (C_{tc}) in parallel to the winding (L_{choke}) and to choose the value of the capacitor relative to the inductance value of the winding the capacitor shares a parallel relationship with. Quarles does not teach or suggest a capacitive element configured to pass the DSL signals traversing the first and second local loops including a capacitor to electrically connect in parallel with the inter-winding capacitance between the inductive windings.

Quarles teaches away from such a limitation. As discussed, Quarles discloses and teaches selecting capacitors having a capacitive value based upon the total capacitance measured between the wires comprising each section of telephone loop to compensate for transient distortion in frequencies in the voice range.

The Reference Data for Radio Engineers is a chart that merely provides parasitic capacitance values based upon a length of a telephone loop wires. The Reference Data for Radio Engineers is completely silent about a capacitor electrically connecting in series with an inter-winding capacitance of the inductive winding. The Reference Data for Radio Engineers does not teach or suggest a capacitor electrically connecting in series with an inter-winding capacitance of the inductive winding.

As discussed above, inadequate motivation exists to combine Quarles and the Reference Data for Radio Engineers. Even if Quarles and the Reference Data for Radio Engineers were properly combined, the combination would still not teach or suggest a capacitive elements configured to pass the DSL signals traversing the first and second local loops including a capacitor to electrically connect in series with an inter-winding capacitance of the inductive winding.

Therefore, claim 23 is not rendered obvious under 35 U.S.C. §103(a) by Quarles and the Reference Data for Radio Engineers, individually or in combination.

The Office Action rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over Quarles in view of the Reference Data for Radio Engineers and further in view of U.S. Patent number 3,848,098 by Pinel. However, Applicants respectfully submit that independent claim 1 is not obvious in view of Quarles, Pinel, and the Reference Data for Radio Engineers.

Under 35 U.S.C. § 103, patent law requires both every claim limitation to be disclosed by the combination of references as well as adequate motivation to combine the references.

Pinel is completely silent regarding circuit capacitance values relative to the inter winding capacitance values between a first and second inductor. Further, Pinel, issued in 1969, is completely silent regarding permitting signals in the DSL frequency range and the POTS frequency range over the same POTS lines. Accordingly, Pinel is completely silent regarding selecting components to support passing signals in the DSL frequencies.

As discussed above, the combination of Quarles and the Reference Data for Radio Engineers does not disclose the limitations of independent claim 1.

Applicants also assert inadequate motivation to combine exists to combine Quarles, Pinel, and the Reference Data for Radio Engineers. As such, for all the reasons above, independent claim 1 is not rendered obvious under 35 U.S.C. §103(a) by Quarles, Pinel, and the Reference Data for Radio Engineers, individually or in combination.

Given that claim 4 depends on and includes the limitations of claim 1, Applicants respectfully submit the claim 4 is also not obvious in view of Quarles, Pinel, and the Reference Data for Radio Engineers.

The Office Action rejected claims 11, 13 through 15 and 17 under 35 U.S.C. 103(a) as being unpatentable over Drew in view of Shenoi. The Examiner states:

> Drew discloses capacitors (Fig. 4, reference 46, 48; column 3, lines 2-3) connected in parallel across the first winding and the second winding. Claim 11 further claims the capacitive elements have capacitance values relative to a capacitance value of either the coupled inductor to improve

> transmission of DSL signals across the load coil. Drew discloses the capacitors that correspond to the capacitive elements claimed having capacitance values of 50 nF to 100 nF (column 3, lines 12-15) and a parasitic winding capacitance (Fig. 4, reference C'w; column 3, lines 5-12) that corresponds to the intra-winding capacitance claimed having a value of 288 pF (0.288 nF) (column 2, lines 26-28). Further, Drew discloses that these capacitance values allow the capacitors to provide a low impedance path for high frequency signals to bypass the windings (i.e., permit passage of DSL signals across the load coil) (column 3, lines 18-20). Therefore, Drew anticipates all elements of Claim 11 with the exception of a DSL signal repeater for disposal along the local loop to amplify the DSL signals, the repeater including a load coil for conditioning POTS signals. Shenoi discloses a DSL repeater (Fig. 4, reference 400; column 7, lines 54-55) that includes load coils (column 7, lines 59-63). It would have been obvious to one skilled in the art at the time of the invention to combine the repeater taught by Shenoi with the load coil taught by Drew for the purpose of providing DSL over long loaded loops.

(Office Action dated 1-20-04, pp. 10-11)

> Regarding [applicants earlier dated office action arguments], Claims 11, 13 through 15 and 17, applicant alleges that the combination of Drew and Shenoi fails to make obvious "capacitive elements have capacitance values relative to a capacitance value of the coupled inductor". Examiner respectfully disagrees. Any capacitance has a value relative to any other capacitance. For example, if a first capacitance has a value of C1 and a second capacitance has a value C2 then inherently either C1>C2 or C1<C2 or C1=C2. As such, C1 has a value relative to C2. Applicant makes reference in the arguments to "the selection of capacitive values", but in a claim that claims both a product and the method of making the product (i.e., a product-by-process claim), patentability is determined based on the product itself. As such, limitations relating to the method by which the capacitance values are selected carry no weight.

(Office Action dated 1-20-04, p. 13)

However, Applicants respectfully submit that claims 11, 13 through 15 and 17 are not obvious in view of Drew and Shenoi. Independent claim 11, as amended, states:

> 11. A system for transmitting DSL and POTS signals over a local loop, the system comprising:
>
> a first load coil for disposal along the local loop to condition the POTS signals, the first load coil including a coupled inductor and multiple

capacitive elements for increasing an effective capacitance of the coupled inductor, wherein the multiple capacitive elements have capacitance values relative to an interwinding capacitance value of the coupled inductor to improve transmission of DSL signals across the first load coil; and

a first DSL signal repeater for disposal along the local loop in series with the first load coil to amplify the DSL signals, the first DSL signal repeater including a second load coil for conditioning POTS signals passing there through.

(emphasis added)

As discussed above, Drew does not teach or suggest the limitation "capacitive elements having capacitance values relative to an inter winding capacitance value of the coupled inductor." Drew discloses and teaches to place a capacitor (C_{tc}) in parallel to the winding (L_{choke}) and to choose the value of the capacitor relative to the inductance value of the winding the capacitor shares a parallel relationship with. Shenoi is completely silent on the selection of capacitive values of components in the load coil. Therefore, neither Drew nor Shenoi, individually or in combination, teach or suggest any capacitive elements having capacitance values relative to an inter winding capacitance value of the coupled inductor. As such, claim 11 is not obvious under 35 U.S. C. 103(a) in view of Drew and Shenoi.

Given that claims 13 through 15 depend on and include the limitations of claim 11, Applicants respectfully submit the claims 13 through 15 are also not obvious under 35 U.S. C. 103(a) in view of Drew and Shenoi.

Likewise, Independent claim 17 states:

17. A system for transmitting DSL and POTS signals over a local loop, the system comprising:

> load coil means positioned along the local loop, the load coil means comprising inductive means for conditioning POTS signals as they traverse the local loop and <u>capacitive means having capacitance values relative to an inter-winding capacitance value of the inductive means</u> coupled to the inductive means for facilitating passage of DSL signals across the load coil; and
>
> DSL signal amplification means positioned along the local loop for amplifying DSL signals as they traverse the local loop.

(emphasis added)

As discussed above, neither Drew nor Shenoi, individually or in combination, teach or suggest any capacitive elements having capacitance values relative to an inter winding capacitance value of the coupled inductor. Drew, in fact, specifically teaches away from such a limitation. As such, claim 17 is not obvious under 35 U.S. C. 103(a) in view of Drew and Shenoi.

The Office Action rejected claims 11 and 12 under 35 U.S.C. 103(a) as being unpatentable over Quarles in view of Reference Data for Radio Engineers and further in view of Shenoi. The Examiner states:

> All elements of Claim 11 are comprehended by Claim 1 with the exception that Claim 11 claims a DSL signal repeater for disposal along the local loop to amplify the DSL signals, the repeater including a load coil for conditioning POTS signals. <u>As stated above apropos of Claim 1, the combination of Quarles and FTRC makes obvious all elements of that claim.</u> Therefore, the combination makes obvious all elements of Claim 11 with the exception of a DSL signal repeater for disposal along the local loop to amplify the DSL signals, the repeater including a load coil for conditioning POTS signals. <u>Shenoi discloses a DSL repeater (Fig. 4, reference 400; column 7, lines 54-55) that includes load coils (column 7, lines 59-63). It would have been obvious to one skilled in the art at the time of the invention to combine the repeater taught by Shenoi with the combination made obvious by Quarles and FTRC for the purpose of providing DSL over long loaded loops.</u>
>
> Claim 12 claims the system of Claim 11 wherein the coupled inductor has first and seconds windings with capacitive elements disposed diagonally across those windings. As stated above apropos of Claim 11, the combination of Quarles and FTRC makes obvious all elements of that claim. In addition, Quarles discloses diagonal disposal of capacitors

> in a loading coil. Therefore the combination makes obvious all elements of Claim 12.

(Office Action dated 1-20-04, pp. 8-9) (emphasis added)

As discussed above, not even one of these three references discloses, teaches or even suggest the limitation "capacitive elements that have capacitance values relative to an interwinding capacitance value of the coupled inductor to improve transmission of DSL signals across the first load coil." All three references are completely silent about capacitive elements that have capacitance values relative to an interwinding capacitance value of the coupled inductor. Quarles in fact teaches away such that the capacitors (condensers) 8 have a capacitance values relative to the length of the line 8. As discussed above, the actual length of a loop does not factor in to the formula for determining a capacitance value of a component or between two components. Further, the Office Action provides in adequate motivation to combine these three references. The Examiner does not cite to any drawings or text within these three references that suggest such a combination. The Examiner does not provide any reasoning why it would be obvious to combine a data chart, a 1929 reference, and a modern day patent on a DSL repeater patent that includes load coils other than they all relate to the telecommunication arts and achieve a result of claim 11. The Examiner merely concludes and states "It would have been obvious to one skilled in the art at the time of the invention to combine the repeater taught by Shenoi with the combination made obvious by Quarles and FTRC for the purpose of providing DSL over long loaded loops." Therefore, on this basis alone, Applicants respectfully submit impressible use of hindsight has occurred and the obviousness rejection of claim 1 has been overcome.

The Office Action objected to claims 6, 16 and 23 because of grammatical informalities. The Examiner objects to the term "to" and states:

> Claim 6 includes the limitation "wherein the first capacitive element to electrically connect in series with the intra-winding capacitance of the first winding". As recited, this limitation is grammatically incorrect. Examiner assumes it is intended as "wherein the first capacitive element is electrically connected in series with the intra-winding capacitance of the first winding".
>
> Claim 16 includes the limitation "wherein the first capacitive means to electrically connect in series with an inter-winding capacitance of the inductive means". As recited, this limitation is grammatically incorrect. Examiner assumes it is intended as "wherein the first capacitive means is electrically connected in series with an inter-winding capacitance of the inductive means".
>
> Claim 23 includes the limitation "wherein the first capacitive element to electrically connect in series with the inter-winding capacitance f the first inductor winding". As recited, this limitation is grammatically incorrect. Examiner assumes it is intended as "wherein the first capacitive element is electrically connected in series with the inter-winding capacitance of the first inductor winding".

(Office Action dated 1-20-04, p. 2)

Applicants respectfully disagree with the Examiner's assertions about the rules of English grammar. However, Applicants submit that claims 16, and 23, as amended, overcome the above rejections. Claim 6 has been canceled without prejudice.

The Office Action rejected claims 6 through 10 and 25 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner states:

> Claim 6 includes the limitation "wherein the first capacitive element to electrically connect in series with the intra-winding capacitance of the first winding". This configuration is not described in the original specification.
>
> Claims 7 through 10 and 25 fail to comply with the written description requirement due to dependence from Claim 6.

(Office Action dated 1-20-04, p. 3)

Claims 6-10 and 25 have been canceled without prejudice.

The Office Action rejected claim 16 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner states :

> Claim 16 includes the limitation "wherein the first capacitive means to electrically connect in series with an inter-winding capacitance of the inductive means". This configuration is not described in the original specification.

(Office Action dated 1-20-04, p. 3)

Applicants respectfully assert that claim 16, as amended, is adequately supported under 35 U.S.C. 112, first paragraph. Applicants assert that claim 16, as amended, is supported throughout the text and drawings of the application as filed. However, Applicants specifically direct the Examiners attention to the top paragraph on page 4, various paragraphs on pages 12 and 13, and figure 3. These sections discuss the cooperation between the inter-winding capacitance of the windings. For example, Applicants' specification discloses:

> <u>One capacitor is disposed between the input of a first inductor winding and the input of the second inductor winding</u>; <u>the other capacitor is disposed between the output of the second inductor winding and the output of the first inductor</u> <u>to increase the effective inter-winding capacitance</u> of the coupled inductor for improving high frequency signal transmission across the load coil.

(Applicants' specification page 4, Lns. 14-18) (emphasis added)

Also, figure 3 illustrates capacitors 320, 322 in parallel with the inter-winding capacitance between winding 302 and winding 304. Applicants' specification further discloses:

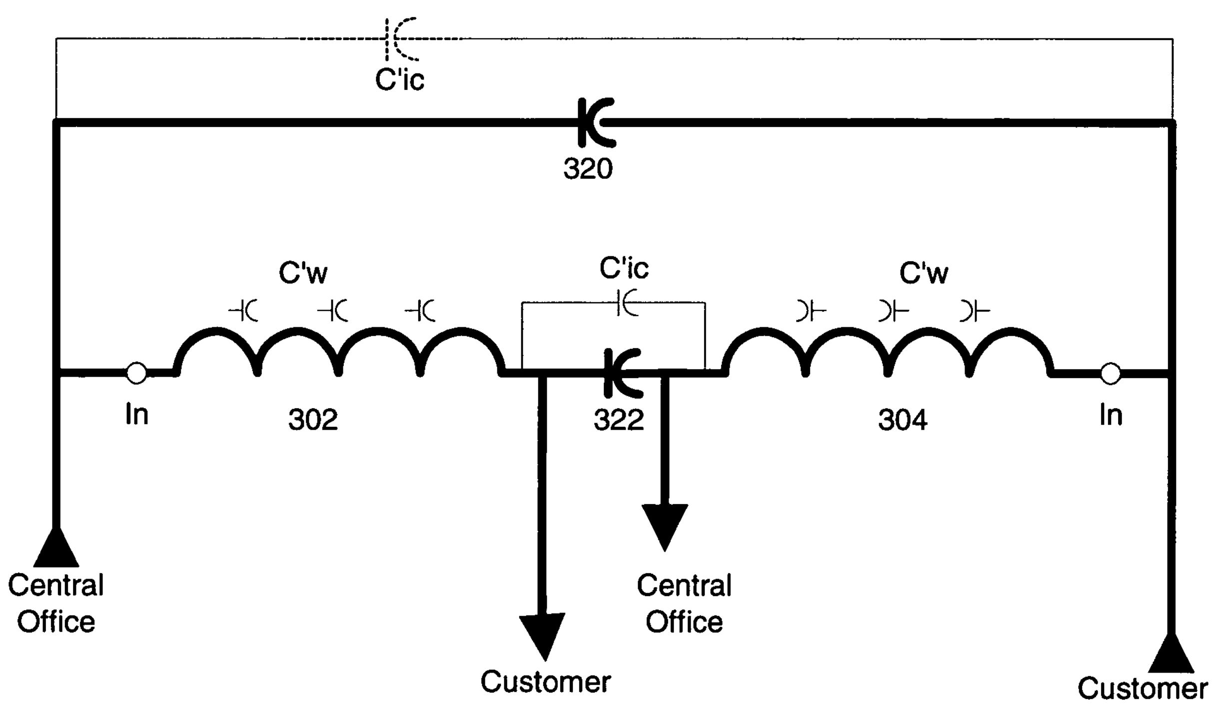
> The load coil 130 also includes capacitive elements, such as capacitors 320 and 322, to increase the effective inter-winding capacitance of the coupled inductor 308 for permitting higher frequency signals, such as xDSL signals, to traverse the load coil 130 with low attenuation. As

> shown, the capacitor 320 is disposed between the lead 312 of winding 302 and the lead 316 of the winding 304. The capacitor 322 is disposed between the lead 318 of the winding 304 and the lead 314 of the winding 302. <u>In this configuration, the capacitors 320 and 322 increase the effective inter-winding capacitance of the coupled inductor 308</u>.

(Applicants' specification page 13, Lns. 14-18) (emphasis added)

Applicants note that adding capacitances electrically in parallel increases the total capacitance value. For capacitors in parallel, the applicable formula to calculate total effective capacitance is: Capacitance total = Capacitance 1 + Capacitance 2.

Applicants present a redrawn electrical equivalent circuit of figure 3. The inter winding capacitance (C'ic) between the inputs and outputs of the pair winding is shown in redrawn figure 3.



Note, a similar inter winding C'ic and intra winding C'w capacitance circuit is illustrated by Figures 2, 4, and 5 in the Drew reference sited by the Examiner. Capacitor 322 is in parallel with the inter-winding capacitance between the output of the

windings 302, 304. Capacitor 320 is in parallel with the inter-winding capacitance of between the inputs of the windings 302, 304. Therefore, Applicants respectfully submit that adequate support for claim 16 can be found through the text and drawings of the application as filed and overcomes the above rejection.

The Office Action rejected claims 18 through 21 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner states:

> Claim 18 includes the limitation "amplifying the DSL signals between the first segment of the local loop and the second segment of the local loop but after the . . . coupled inductor". This configuration is not described in the original specification. Claims 19 through 21 fail to comply with the written description requirement due to dependence from Claim 18.

(Office Action dated 1-20-04, p. 3)

Applicants respectfully assert that claim 18, as amended, is adequately supported under 35 U.S.C. 112, first paragraph. Claim 18, as amended, states "amplifying the DSL signals between the first segment of the local loop and <u>a third segment</u> of the local loop but after the coupled inductor and the capacitive elements." Applicants assert that claim 18, as amended, is supported throughout the text and drawings of the application as filed. However, Applicants specifically direct the Examiner's attention to figure 1. Figure 1 shows an example implementation where a first segment of loop 116 connects to load coil 130 and then to an amplifying repeater 132. After the amplifying repeater 132, several local loop segments 116 connect to that electrical pathway. Therefore, Applicants respectfully submit that adequate support for claim 18 can be found throughout the text and drawings of the application as filed and

overcomes the above rejection. As such, claims 19-21 also overcome the above rejection.

The Office Action rejected claim 23 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner states :

> Claim 23 includes the limitation "wherein the first capacitive element to electrically connect in series with the inter-winding capacitance of the first inductor winding". This configuration is not described in the original specification.

(Office Action dated 1-20-04, p. 4)

Applicants respectfully assert that claim 23, as amended, is adequately supported under 35 U.S.C. 112, first paragraph. Claim 23, as amended, states "a capacitive element electrically connects in parallel between the inter-winding capacitance of the first inductor winding and the second inductor winding." However, as discussed above, Applicants specifically direct the Examiners attention to the top paragraph on page 4, various paragraphs on pages 12 and 13, and figure 3. These sections discuss the cooperation between the inter-winding capacitance of the windings. Therefore, Applicants respectfully submit that adequate support for claim 23 can be found through the text and drawings of the application as filed and overcomes the above rejection.

The Office Action rejected claims 6 through 10 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 6 through 10 and 25 have been canceled without prejudice.

The Office Action rejected claims 18 through 21 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner states:

> Claim 18 includes the limitations "inductively coupling a first segment of the local loop to a second segment of the local loop via a coupled inductor" and "amplifying the DSL signals between the first segment of the local loop and the second segment of the local loop but after the . . . coupled inductor". Since the inductor couples together the two loop segments, it is unclear how the amplification can simultaneously take place between the segments and after the inductor. Therefore the claim is indefinite. Claims 19 through 21 are indefinite due to dependence on Claim 18.

(Office Action dated 1-20-04, pp. 4-5)

Applicants respectfully assert that claim 18, as amended, particularly points out the invention under 35 U.S.C. 112, second paragraph. Claim 18, as amended, states "amplifying the DSL signals between the first segment of the local loop and <u>a third segment</u> of the local loop but after the coupled inductor and the capacitive elements." Claim 18, as amended, does not require simultaneous amplification and inductive coupling." Therefore, Applicants respectfully submit that claim 18 is not indefinite or ambiguous and overcomes the above rejection.

The Office Action rejected claim 23 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner states:

> Claim 23 includes the limitations "a first capacitor coupling the first wire to the fourth wire" and "wherein the first capacitive element to electrically connect in series with the inter-winding capacitance of the first inductor winding". Inter-winding capacitance results from the capacitance

> between the different windings of a transformer and as such is an equivalent capacitance between the windings (see Testing Inter-winding Capacitance). Therefore, "a first capacitor coupling the first wire to the fourth wire" would inherently be in parallel with the inter-winding capacitance between the windings and could not simultaneously be "in series with the inter-winding capacitance of the first inductor winding". As such it is unclear whether the first capacitive element is in series or parallel with the inter-winding capacitance. Further, since inter-winding capacitance is the capacitance between two different windings, the meaning of "the inter-winding capacitance of the first inductor winding" is unclear. Therefore, the claim is indefinite.

(Office Action dated 1-20-04, p. 5)

Claim 23, as amended, states "a capacitive element electrically connects in parallel between the inter-winding capacitance of the first inductor winding and the second inductor winding." Therefore, Applicants respectfully submit that claim 18 is not indefinite or ambiguous and overcomes the above rejection.

CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, the rejections and objections have been overcome. Applicants respectfully request that a timely Notice of Allowance be issued in this case. A Notice of intent to appeal is also submitted with this amendment. If there are any additional charges, please charge them to our Deposit Account No. 02-2666.

Respectfully submitted,
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